

REMARKS

Claims 1-3, 6-16, 18, 21-31, and 34-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Hoff, “Atomic Oxygen and the Thermal Oxidation of Silicon,” or Ruzyllo, “Evaluation of Thin Oxides Grown by the Atomic Oxygen Afterglow Method.” Reconsideration is respectfully requested.

The Office Action asserts that Wang teaches that the “second oxide layer is formed by oxidizing said nitride layer with an ambient containing atomic oxygen.” (Office Action, pg. 3) (emphasis added). Applicants respectfully disagree. Wang does not teach or suggest in any manner that ‘atomic oxygen’ is used to form the second oxide layer.

Wang teaches that the “second of the two oxide layers . . . is formed using a nitride oxidation technique.” (Col. 3, lines 49-54) (emphasis added). Wang teaches ‘nitride oxidation’ to form the top oxide layer and not a “second oxide layer grown . . . with a gas ambient containing atomic oxygen,” as recited in claim 1 (emphasis added), or “growing a second oxide layer . . . using a gas ambient containing atomic oxygen,” as recited in claim 16 (emphasis added), or that the “second oxide layer is grown in the presence of atomic oxygen,” as recited in claim 31 (emphasis added).

The Office Action then asserts that both Hoff and Ruzyllo “disclose forming an oxide layer . . . using an oxidizing method with atomic oxygen,” and concludes that it would have been obvious to modify the process of Wang “so as to form the second oxide layer using the process taught by Hoff et al. or Ruzyllo et al. because both of these processes allow for oxide growth at low temperatures with high breakdown values.” (Office Action, pg. 3). Applicants respectfully submit that there is no motivation to combine the references and the references, even if properly combinable, do not teach or suggest using “atomic oxygen” for the purpose of forming a “second oxide layer . . . [having] a thickness of at least 60% of the targeted thickness of the second oxide layer,” as recited in claim 1 (emphasis added).

Wang provides a method “for reducing the gate aspect ratio of a flash memory device . . . [by using] nickel silicide instead of the conventional tungsten silicide in the control gate layers of the cells of the device.” (Col. 4, lines 42-45) (emphasis added). As a result, there is no motivation to use atomic oxygen to form Wang’s ONO structure. Further, Wang’s entire disclosure is directed to reducing the gate aspect ratio and teaches only a conventionally-formed ONO structure.

The Office Action asserts that the motivation to combine the references stems from the fact that “these processes allow for oxide growth at low temperatures with high breakdown values.” (Office Action, pg. 3). However, there is no teaching or suggestion in Wang that a low-temperature thermal budget process is needed in forming the ONO structure. Wang teaches forming the top oxide layer with nitride oxidation at a temperature of 950°C. This is not a low-temperature process nor does Wang teach or suggest that a low-temperature process is needed for forming an ONO structure.

Moreover, the alleged combination of references still would not teach or suggest, a “second oxide layer [which] is formed to have a thickness of at least 60% of the targeted thickness of the second oxide layer,” as recited in claim 1. Hoff and Ruzyllo are directed to a low-temperature atomic oxygen afterglow method and not to forming an oxide layer of an ONO structure that is 60% of the targeted thickness.

Still further, the alleged combination of references do not teach “growing a second oxide layer over said nitride layer . . . at a temperature of about 850°C to about 1100°C, for about 1 second to about 10 minutes, using a gas ambient containing atomic oxygen,” as recited in claim 16 (emphasis added), or that the “second oxide layer is grown in the presence of atomic oxygen at a temperature of less than about 900°C,” as recited in claim 31 (emphasis added). The Office Action asserts that “it would have been obvious to determine through routine experimentation the optimum time and temperature to conduct the oxidation process.” (Office Action, pg. 3). No support has been provided for this assertion. In other words, the combination of cited references simply do not teach or

suggest Applicants' claimed temperature or time for forming the top oxide layer using atomic oxygen.

Claims 2-3 and 6-15 depend from and incorporate all of the limitations found in independent claim 1, claims 18 and 21-30 depend from and incorporate all of the limitations found in independent claim 16, and claims 34-45 depend from and incorporate all of the limitations found in independent claim 31. These claims are at least allowable for the reasons set forth above regarding independent claims 1, 16, and 31.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Dated: June 19, 2003

Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorney for Applicants